

REMARKS

The Office Action mailed March 4, 2009 has been carefully considered. Reconsideration in view of the following remarks is respectfully requested.

Amendment to Claims 1-19

Claims 1-19 have been amended for improved clarity and grammatical accuracy. The amendment does not raise any issues beyond those already considered by the Examiner. Moreover, the amendment is supported by the original disclosure. *See, e.g.*, without limitation, p. 2, l. 31 to p. 3, l. 3; p. 9, ll. 21-27; p. 10, ll. 19-23, and various examples involving sensors.

No amendment made is related to the statutory requirements of patentability unless expressly stated herein. No amendment is made for the purpose of narrowing the scope of any claim, unless Applicant argues herein that such amendment is made to distinguish over a particular identified reference or combination of references. Any remarks made herein with respect to a given claim or amendment is intended only in the context of that specific claim or amendment, and should not be applied to other claims, amendments or aspects of Applicant's invention.

Rejection(s) Under 35 U.S.C. § 101 and 35 U.S.C. § 112, Second Paragraph

Claims 1-19 stand rejected under 35 U.S.C. § 101 as unpatentable subject matter, and under 35 U.S.C. § 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. According to the Examiner, "the claims do not set forth any steps involved in the method/process." As amended, claims 1-19 set forth methods for detecting the presence of at least one nitro compound in a medium, and each of these methods include various steps. Therefore, claims 1-19 are patentable subject matter and are definite pursuant to 35 U.S.C. §§ 101 and 112.

Rejection(s) Under 35 U.S.C. §102

Claims 1-3 stand rejected under 35 U.S.C. §102(b) as allegedly being anticipated by McGill et al. ("The design of functionalized silicone polymers for chemical sensor detection of nitroaromatic compounds").

It will be appreciated that, according to the M.P.E.P., a claim is anticipated under 35 U.S.C. §102 only if each and every claim element is found, either expressly or inherently described, in a single prior art reference.¹

McGill discloses the polysiloxanes SXPFA (McGill, Fig. 5), SXFA, SXPH, SXCN, and OV202 (McGill, Fig. 2). In SXPFA, the silicon atom bears a phenyl group which is itself substituted by a hexafluoroisopropanol group. In claim 1, however, as well as all its dependent claims, the silicon atom is bound to (X-R₁) and (Y-R₂), neither of which include a phenyl group or a hexafluoroisopropanol group, because X and Y must be a “single bond or a saturated or unsaturated, linear hydrocarbon group,” and R₁ and R₂ must be “a hydrogen atom, a CN group, a group C(Z)₃, CH(Z)₂, or CH₂Z with Z representing a halogen atom, a NH₂ group, a group NHR₃, or NR₃R₄...,” which do not include phenyl or hexafluoroisopropanol groups. While it is true that R₃ and R₄ may be a branched unsaturated hydrocarbon chain comprising from 2 to 20 carbon atoms and possibly one or more heteroatoms, R₃ and R₄ are parts of an amino group, which is not disclosed in McGill.

For the same reasons, claims 1-3 are not anticipated by McGill as a result of the disclosure of the SXFA (which bears an alkylene group ended by a hexafluoroisopropanol group) and SXPH (in which the silicon atom of one unit bears a phenyl group and a methyl group, and the silicon atom of the other unit bears two phenyl groups). Neither SXFA nor SXPH fall within the scope of claims 1-3, or any other dependents of claim 1.

As to McGill’s disclosure of SXCN and OV202, McGill does not describe the use or utility of these polymers as sensitive materials in a sensor as part of a process aimed at detecting nitro compounds—and in fact teaches away from that possibility. Rather than describe their use in a sensor, McGill merely touches on SXCN and OV202 to discuss the sorption properties of the nitroaromatic compounds mentioned in Table 1 in these polymers. McGill observed that, for 2,4,6-trinitrotoluene (246TNT), the highest *K_p* value (corresponding to the most important sorption of 246TNT vapors in a polymer) was obtained in the polymer P4V shown in Figure 2, which P4V is constituted by an alkyl chain bearing phenyl groups which are each substituted by a hexafluoroisopropanol group. In Figures 3a and 3b, McGill shows that the *K_p* value of 246TNT is between 4.6 and 4.8 x 10¹² in P4V whereas it never reaches 10¹¹ in the other polymers. Thus, for example, the *K_p* value is only 6.5 x 10¹⁰ in SXCN and 0.5 x 10¹⁰ in OV202.

¹ Manual of Patent Examining Procedure (MPEP) § 2131. See also *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

As P4V is a strongly dipolar compound and has many hydrogen-bond acidic (hba) sites whereas the nitroaromatic compounds have many hydrogen-bond basic (hbb) sites, McGill concluded that the sorption of a nitroaromatic compound in a polymer is important when the nitroaromatic compound and the polymer have complementary solubility characteristics. thus, according to McGill, a polymer which is intended to be used as a sensitive material in a sensor for detecting nitroaromatic compounds must have solubility properties complementary to the ones of the nitroaromatic compounds. However, as P4V is crystalline and does not have ideal physical characteristics for a chemical sensor coating (see McGill, p. 8, left column), McGill decided to synthesize polysiloxanes (in view of the rubber properties that this type of polymer generally has) having pending aromatic groups functionalized with one or more hexafluoroisopropanol groups. It is *these* polysiloxanes that McGill has used for coating SAW sensors which have been later exposed to nitroaromatic compound vapors (see McGill, p. 8, right column).

An example of these polysiloxanes favored by McGill would be SXPHFA, which as explained above is not within the scope of claims 1-3. As a result of tests made by McGill for detecting nitrobenzene (NB) and 2,4-dinitrotoluene (24DNT) with SXPHFA as well as the ATR-FTIR analysis that they have made on this polymer before and after exposure to NB, McGill concluded that the ability to use a polymer such as SXPHFA as an effective sensitive material for a sensor depends upon the ability of this polymer to retain very quickly the nitroaromatic compound vapors. According to McGill, this ability to retain vapors depends itself on the ability of the polymer to react with the molecules of nitroaromatic compounds by forming hydrogen bonds between the -OH groups of its hexafluoroisopropanol groups and the -NO₂ groups of the nitroaromatic compounds (see McGill, "Summary and Conclusions").

Accordingly, not only does McGill not disclose the use of SXCN and OV202 as sensitive materials for use in a sensor aimed at detecting nitro compounds, but McGill teaches away from the use of SXCN and OV202 in such a manner. McGill shows that SXCN and OV202 have especially low *K_p* values (McGill, Fig. 3b), and are further devoid of any aromatic pending group as well as of any -OH group able to form hydrogen bonds with the -NO₂ groups of the nitro compounds.

The present application, see Example 6, has shown the Fully unexpected result that a sensor comprising a thin film of a polycyanopropylmethylsiloxane (which has neither an aromatic pending group nor an -OH group) has a sensitivity towards vapors of reference

compound dinitrotrifluoromethoxybenzene (DNTFMB) that is *three times higher* than the sensitivity of a sensor comprising a thin film of a polysiloxane wherein 47% of the units have a silicon atom bearing an aromatic group substituted by two hexafluoroisopropanol groups.

The aforementioned reasons clearly indicate that all the elements of claims 1-3 are not found within McGill, and withdrawal of the 35 U.S.C. §102 rejection based on McGill is respectfully urged.

Rejection(s) Under 35 U.S.C. §103(a)

Claims 4-6, 8-11 and 16-19 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over McGill et al (“The design of functionalized silicone polymers for chemical sensor detection of nitroaromatic compounds”) in view of Aker et al (US 2003/0165407). As discussed above, McGill teaches away from the invention of independent claim 1. Thus, claim 1 and all its dependent claims are unobvious in view of McGill, standing alone.

Claims 4-6, 8-11 and 16-19 variously depend, directly or indirectly, from the base claim 1 addressed above. Aker fails to remedy the above-mentioned shortcomings of McGill with respect to the base claim. In particular, in Aker, the polysiloxanes are *not* used as sensitive material, but as a gas chromatographic stationary phase in an adsorption/desorption zone (40) or “trap” zone which is located in a capillary (13), *upstream* from the sensing zone (42) in which is located the sensitive material.

In Aker, the sensitive material is made of a fluorescent polymer (see claim, which recites “a sensing unit constructed of an amplifying fluorescent polymer, the intensity of light emitted by the amplifying fluorescent polymer varying in response to interaction of the amplifying fluorescent polymer with molecules of the analyte delivered by the carrier” (emphasis added)). This fluorescent polymer has the formula shown in Fig. 1A, wherein A and C are aromatic groups and B and D are carbon-carbon double or triple bonds, and is preferably the fluorescent polymer shown in Figure 1B.

Aker explains that the adsorption/desorption zone (40) formed by the polysiloxanes has the function of slowing down the migration of the explosive related compounds (ERC’s) within the capillary (13) with regard to the migration of the other volatile organic compounds so as to avoid that the fluorescence emitted by the amplifying fluorescent polymers on contact with the ERC’s is quenched by the other volatile compounds (see notably para. 0037 of Aker).

In other words, Aker teaches the use of polysiloxanes as materials for slowing down the migration of ERC's with regard to the migration of other volatile organic compounds. Aker does not teach or even suggest the use of polysiloxanes as sensitive materials.

Claims 7 and 12-15 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over McGill et al. in view of Lewis et al. (US 6,387,329). As discussed above, McGill teaches away from the invention of independent claim 1. Thus, claim 1 and all its dependent claims are unobvious in view of McGill, standing alone. Claims 7 and 12-15 variously depend, directly or indirectly, from the base claim 1 addressed above. Lewis fails to remedy the above-mentioned shortcomings of McGill with respect to the base claim. In particular, Lewis relates to sensors that can be used in a wide variety of applications and for detecting a wide variety of chemical species (see col. 7, last para., cols. 8-9). Lewis merely shows that it was known in the prior art, on the one hand, to use composites made of polymers and conductive fillers such as carbon black particles as sensitive materials in sensors and, on the other hand, to manufacture gravimetric and resistive sensors. However, Lewis does not teach or even suggest the use of the polysiloxanes that are defined in claim 1 and its dependent claims as sensitive materials in sensors intended to detect nitro compounds.

According to the Manual of Patent Examining Procedure (M.P.E.P.),

To establish a *prima facie* case of obviousness, three basic criteria must be met. First there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in the applicant's disclosure.²

In this case, the rejection based on the combination of the McGill and Aker fails to rise to the level of a *prima facie* case of obviousness, at least for the reasons outlined above. Similarly, the rejection based on the combination of McGill and Lewis fails to rise to the level of *prima facie* obviousness. Accordingly, it is respectfully urged that the obviousness rejection of claims 1-19 is improper and should be withdrawn.

² M.P.E.P. § 2143.

Newly-Added Claims

Claims 20 has been added to further particularly point out and distinctly claim the subject matter regarded as the invention.

Conclusion

In view of the preceding discussion, Applicants respectfully urge that the claims of the present application define patentable subject matter and should be passed to allowance.

If the Examiner believes that a telephone call would help advance prosecution of the present invention, the Examiner is kindly invited to call the undersigned attorney at the number below.

Please charge any additional required fees, including those necessary to obtain extensions of time to render timely the filing of the instant Amendment and/or Reply to Office Action, or credit any overpayment not otherwise credited, to our deposit account no. 50-3557.

Respectfully submitted,
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